

CLAIMS

I claim:

- Sub A17
- 5
1. A contoured structural member, comprising:
at least one contoured inner layer comprising a metal-containing material;
at least one contoured outer layer comprising a metal-containing material; and
at least one intermediate layer having a ribbed structure connecting the at least
one inner layer and the at least one outer layer.
- 10
2. The structural member of claim 1, wherein the structural member has a
closed configuration.
3. The structural member of claim 2, further comprising an interior region
defined by an inner surface of the at least one inner layer.
- 15
4. The structural member of claim 3, wherein the interior region is hollow,
partially filled, or completely filled.
5. The structural member of claim 1, wherein the metal-containing material
is a light metal or alloy thereof.
6. The structural member of claim 5, wherein the light metal is aluminum.
7. The structural member of claim 1, wherein the metal-containing material
is a heavy metal or alloy thereof.
- 20
8. The structural member of claim 7, wherein the metal-containing material
is stainless steel.
- Sub A2
Sub A3
Sub A4

SubA4)
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at least one contoured outer layer comprising a metal-containing material;
at least one intermediate layer having a honeycomb structure being substantially
contiguous with the at least one inner layer and the at least one outer layer; and
an interior region defined by an inner surface of the at least one inner layer.

5 21. A method for making a contoured structural member, comprising:
providing at least one inner layer comprising a metal-containing material;
roll wrapping at least one intermediate layer over the at least one inner layer, the
at least one intermediate layer having a ribbed structure; and
providing at least one outer layer over the at least one intermediate layer, the at
10 least one outer layer comprising a metal-containing material; and
connecting the at least one inner and outer layer to the at least one intermediate
layer.

22. The method of claim 21, including providing the at least one inner layer by
roll wrapping the at least one inner layer over a substrate.

15 23. The method of claim 22, including providing the at least one outer layer
by roll wrapping the at least one outer layer over the at least one intermediate layer.

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~~24. The method of claim 23, further including removing the substrate.~~

~~25.~~ 13 The method of claim ~~24~~ 12, including partially or completely filling the
interior created by removing the substrate.

26. The method of claim 25, further including constraining the at least one outer layer when connecting the at least one inner and at least one outer layer to the at least one intermediate layer prior to removing the substrate.

27. The method of claim 26, including constraining the at least one outer layer by roll wrapping at least one layer of a shrink-wrap material over the at least one outer layer.

28. The method of claim 27, including removing the at least one layer of the shrink-wrap material after the reaction.

29. The method of claim 27, further including providing at least one pressure distributor over the at least one outer layer.

30. The method of claim 29, including providing a plurality of layers of shrink-wrap material with the at least one pressure distributor between two of said layers.

31. A method for making a contoured structural member, comprising:
roll wrapping at least one inner layer comprising a metal-containing material over a substrate;

roll wrapping at least one intermediate layer over the at least one inner layer, the at least one intermediate layer having a ribbed structure; and

roll wrapping at least one outer layer covering the at least one intermediate layer, the at least one outer layer comprising a metal-containing material;

SubA3
9. The structural member of claim 1, wherein the metal-containing material in the inner and portion are the same.

10. The structural member of claim 7, wherein the ribbed structure of the at least one intermediate layer comprises a honeycomb structure.

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5 11. The structural member of claim 1, further comprising at least one layer or portion covering at least a portion of the at least one outer layer.

12. A contoured structural member, comprising:
at least one contoured inner layer comprising a metal-containing material;
at least one contoured outer layer comprising a composite material; and
10 at least one intermediate layer having a ribbed structure connecting the at least one inner layer and the at least one outer layer.

13. The structural member of claim 12, wherein the ribbed structure of the at least one intermediate layer comprises a honeycomb structure.

14. A contoured structural member, comprising:
15 at least one contoured inner layer comprising a composite material;
at least one contoured outer layer comprising a metal-containing material; and
at least one intermediate layer having a ribbed structure connecting the at least one inner layer and the at least one outer layer.

Sub C7
20 15. The structural member of claim 14, wherein the ribbed structure of the at least one intermediate layer comprises a honeycomb structure.

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5 16. A contoured structural member, comprising:
at least one contoured inner layer comprising a metal-containing material;
at least one contoured outer layer comprising a metal-containing material; and
at least one intermediate layer having a honeycomb structure connecting the at
least one inner layer and the at least one outer layer.

17. The structural member of claim 16, further comprising an interior region
defined by an inner surface of the at least one inner layer.

10 18. A contoured structural member, comprising:
at least one contoured inner layer comprising a metal-containing material;
at least one contoured outer layer comprising a metal-containing material;
at least one intermediate layer having a honeycomb structure connecting the at
least one inner layer and the at least one outer layer; and

an interior region defined by an inner surface of the at least one inner layer.

15 19. A closed, contoured structural member, comprising:
at least one contoured inner layer comprising a metal-containing material;
at least one contoured outer layer comprising a metal-containing material;
at least one intermediate layer having a honeycomb structure connecting the at
least one inner layer and the at least one outer layer; and

an interior region defined by an inner surface of the at least one inner layer.

20 20. A closed, contoured structural member, comprising:
at least one contoured inner layer comprising a metal-containing material;

removing the substrate.

32. A method for making a contoured structural member, comprising:

5 roll wrapping at least one inner layer comprising a metal-containing material over a substrate;

5 roll wrapping at least one inner layer comprising a metal-containing material over
a substrate;

roll wrapping at least one outer layer covering the at least one intermediate layer,
10 the at least one outer layer comprising a metal-containing material;

connecting the at least one inner and outer layer to the at least one intermediate layer; and

15 / 33. A method for making a contoured structural member, comprising:

roll wrapping at least one intermediate layer having a honeycomb structure to be substantially contiguous with the at least one inner layer; and

roll wrapping at least one outer layer to be substantially contiguous with the at least one intermediate layer, the at least one outer layer comprising metal-containing material;

constraining the outer portion with a shrink-wrap material;

connecting the at least one inner and outer layer to the at least one intermediate layer; and

removing the shrink-wrap material and the substrate.

34. A contoured structural member made by the method comprising:

providing at least one inner layer comprising a metal-containing material;

roll wrapping at least one intermediate layer over the at least one inner layer, the at least one intermediate layer having a ribbed structure; and

providing at least one outer layer over the at least one intermediate layer, the at least one outer layer comprising a metal-containing material; and

connecting the at least one inner and outer layer to the at least one intermediate layer.

35. A contoured structural member made by the method comprising:

roll wrapping at least one inner layer comprising a metal-containing material over a substrate;

roll wrapping at least one intermediate layer over the at least one inner layer, the at least one intermediate layer having a ribbed structure; and

roll wrapping at least one outer layer covering the at least one intermediate layer,
the at least one outer layer comprising a metal-containing material;

constraining the outer portion with a shrink-wrap material;

connecting the at least one inner and outer layer to the at least one intermediate

5 layer; and

removing the shrink-wrap material and the substrate.

36. A contoured structural member made by the method comprising:

roll wrapping at least one inner layer comprising a metal-containing material over
a substrate;

10 roll wrapping at least one intermediate layer having a honeycomb structure to be
substantially contiguous with the at least one inner layer; and

roll wrapping at least one outer layer to be substantially contiguous with the at
least one intermediate layer, the at least one outer layer comprising a metal-containing
material;

15 constraining the outer portion with a shrink-wrap material;

connecting the at least one inner and outer layer to the at least one intermediate
layer; and

removing the shrink-wrap material and the substrate.

37. A method for making a contoured structural member, comprising:

20 providing at least one inner layer comprising a metal-containing material;

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Sub 16

roll wrapping at least one intermediate layer over the at least one inner layer, the
at least one intermediate layer having a ribbed structure; and

providing at least one outer layer over the at least one intermediate layer, the at
least one outer layer comprising a composite material; and

5 connecting the at least one inner and outer layer to the at least one intermediate
layer.

38. A method for making a contoured structural member, comprising:

providing at least one inner layer comprising a composite material;

10 roll wrapping at least one intermediate layer over the at least one inner layer, the
at least one intermediate layer having a ribbed structure; and

providing at least one outer layer over the at least one intermediate layer, the at
least one outer layer comprising a metal-containing material; and

connecting the at least one inner and outer layer to the at least one intermediate
layer.

15 39. A contoured structural member made by the method comprising:

providing at least one inner layer comprising a metal-containing material;

roll wrapping at least one intermediate layer over the at least one inner layer, the
at least one intermediate layer having a ribbed structure; and

20 providing at least one outer layer over the at least one intermediate layer, the at
least one outer layer comprising a composite material; and

connecting the at least one inner and outer layer to the at least one intermediate layer.

40. A contoured structural member made by the method comprising:

~~providing at least one inner layer comprising a composite material;~~

5 ~~roll wrapping at least one intermediate layer over the at least one inner layer, the~~

at ~~least one~~ intermediate layer having a ribbed structure; and

providing at least one outer layer over the at least one intermediate layer, the at

least one outer layer comprising a metal-containing material; and

connecting the at least one inner and outer layer to the at least one intermediate

10 ~~layer.~~

10 ~~layer.~~